I CLAIM:

1. A directional coupler for coupling a signal receiver to a communications circuit having a signal line adapted to simultaneously carry a transmit (Tx) signal sourced from a line driver and a receive (Rx) signal having a frequency differing from that of the TX signal and a compensation network connected to an output of the line driver for balancing an impedance of the signal line, the directional coupler circuit comprising:

   a) a primary network connected to the communications circuit, the primary network attenuating frequencies in a frequency band of the Tx signal, and having a primary network output;

   b) an amplifier having an amplifier input connected to the primary network output, and an amplifier output connected to the receiver; and

   c) a feedback network for attenuating frequencies in a frequency band of the Tx signal, and connected between the amplifier input and the amplifier output;

   wherein the primary network, the amplifier, and feedback network are arranged to provide a virtual ground at the amplifier input.

2. A directional coupler as claimed in claim 1, wherein the primary network and feedback network are adapted to cooperate to provide a 2nd order filter characteristic of the directional coupler circuit, the 2nd order filter characteristic having a cut-off

frequency selected such that a frequency of the Tx signal is attenuated.

3. A directional coupler as claimed in claim 2, wherein the 2nd order filter characteristic of the directional coupler circuit is a notch filter characteristic having a center frequency substantially corresponding to a frequency of the Tx signal.

4. A directional coupler as claimed in claim 2, wherein the 2nd order filter characteristic of the directional coupler circuit is a Chebychev filter characteristic.

5. A directional coupler as claimed in claim 1, wherein the primary network comprises:

a) a first input connected to the signal line for receiving a mixed signal;

b) a second input operatively connected to the compensation network for receiving a compensation signal; and

c) a filter network connected between the first and second inputs and the primary network output.

6. A directional coupler as claimed in claim 5, wherein the filter network comprises a partially-split 4-port resistor-capacity (RC) network connected between the first and second inputs and the primary network output.

7. A directional coupler as claimed in claim 6, wherein the partially-split 4-port RC network comprises:

a) an output portion comprising a resistor and a capacitor connected in parallel to the primary network output; and

b) a pair of input portions connected between respective ones of the first and second inputs and the output portion, each input portion comprising a resistor connected in series with the resistor of the output portion, and a capacitor connected in series with the capacitor of the output portion.

8. A directional coupler as claimed in claim 7, wherein the partially-split 4-port RC network further comprises:

a) a resistor connected between ground and a junction between the capacitors of the input and output portions; and

b) a capacitor connected between ground and a junction between the resistors of the input and output portions.

9. A directional coupler as claimed in claim 5, wherein the primary network comprises a 4-port RC network connected to the first and second inputs via respective first and second resistances.

10. A directional coupler as claimed in claim 9, wherein the 4-port RC network comprises first and second branches connected in parallel, the first branch comprising a pair of series connected resistors and a capacitor connected between ground and a junction between the series connected resistors; and the second branch comprising a pair of series connected

capacitors and a resistor connected between ground and a junction between the series connected capacitors.

11. A directional coupler as claimed in claim 5, wherein the primary network comprises:

a) a first 4-port RC network connected between the first input and the primary network output; and

b) a second 4-port RC network connected between the second input and the primary network output;.

12. A directional coupler as claimed in claim 11, wherein each 4-port RC network comprises first and second branches connected in parallel, the first branch comprising a pair of series connected resistors and a capacitor connected between ground and a junction between the series connected resistors; and the second branch comprising a pair of series connected capacitors and a resistor connected between ground and a junction between the series connected capacitors.

13. A directional coupler as claimed in claim 1, wherein the feedback network comprises first and second branches connected in parallel, the first branch comprising a pair of series connected resistors and a capacitor connected between ground and a junction between the series connected resistors; and the second branch comprising a capacitor.

14. A directional coupler as claimed in claim 5, wherein the primary network output comprises a controllable gain stage.

15. A directional coupler as claimed in claim 14, wherein the controllable gain stage comprises an attenuation network connected in parallel with a gain control switch.

16. A directional coupler as claimed in claim 15, wherein the attenuation network is adapted to attenuate a signal substantially without altering an in-band filter characteristic of the directional coupler.

17. A directional coupler as claimed in claim 15, wherein the attenuation network comprises a pair of series connected resistors, and a capacitor connected in parallel with one of the pair of series connected resistors.

18. A directional coupler as claimed in claim 15, wherein the gain control switch is adapted to selectively bypass the attenuation network.

19. A modem comprising:

a) a communications circuit for coupling a signal source of the modem to a telecommunications network, the communications circuit comprising a signal line adapted to simultaneously carry a transmit (Tx) signal and a receive (Rx) signal and a compensation network connected to the signal line for balancing an impedance of the signal line; and

b) a directional coupler for coupling a signal receiver of the modem to the communications circuit, the directional coupler circuit comprising:

i) a primary network connected to the communications circuit, the primary network being tuned to attenuate frequencies in a frequency band of the Tx signal, and having a respective primary network output;

ii) an amplifier having a respective amplifier input connected to the primary network output, and a respective amplifier output connected to the receiver; and

iii) a feedback network tuned to attenuate frequencies in a frequency band of the Tx signal, and connected between the amplifier input and the amplifier output;

wherein the primary network, the amplifier, and feedback network are arranged to provide a virtual ground at the amplifier input.

20. A modem as claimed in claim 19, wherein the signal line comprises first and second signal line impedances connected in series between a transmit line driver and the local loop, the first input being connected to the signal line between the first and second signal line impedances.

21. A modem as claimed in claim 20, wherein the first signal line impedance is a resistor, and the second signal line impedance is an inductance.

22. A modem as claimed in claim 21, wherein the second signal line impedance comprises a coil of a line transformer connecting the signal line to the local loop.

23. A modem as claimed in claim 20, wherein the compensation network comprises first and second compensation impedances connected in series, the second input being connected to the compensation network between the first and second compensation impedances.

24. A modem as claimed in claim 23, wherein the first compensation impedance is a resistor, and the second compensation impedance is an inductance.

25. A modem as claimed in claim 19, wherein the primary network and the feedback network are adapted to cooperate to provide a notch filter characteristic of the directional coupler, the notch filter characteristic having a center frequency substantially corresponding to a frequency of the Tx signal.

26. A modem as claimed in claim 19, wherein the primary network comprises:

a) a first input connected to the signal line for receiving a mixed signal;

b) a second input operatively connected to the compensation network for receiving a compensation signal; and

c) a filter network connected between the first and second inputs and the primary network output.

27. A modem as claimed in claim 26, wherein the filter network comprises a partially-split 4-port resistor-capacity (RC) network connected between the

first and second filter inputs and the primary network output.

28. A modem as claimed in claim 27, wherein the partially-split 4-port RC network comprises:

a) an output portion comprising a resistor and a capacitor connected in parallel to the primary network output; and

b) a pair of input portions connected between respective ones of the first and second inputs and the output portion, each input portion comprising a resistor connected in series with the resistor of the output portion, and a capacitor connected in series with the capacitor of the output portion.

29. A modem as claimed in claim 28, wherein the partially-split 4-port RC network further comprises:

a) a resistor connected between ground and a junction between the capacitors of the input and output portions; and

b) a capacitor connected between ground and a junction between the resistors of the input and output portions.

30. A modem as claimed in claim 27, wherein the filter network comprises a 4-port RC network connected to the first and second inputs via respective first and second resistances.

31. A modem as claimed in claim 30, wherein the 4-port RC network comprises first and second branches connected

in parallel, the first branch comprising a pair of series connected resistors and a capacitor connected between ground and a junction between the series connected resistors; and the second branch comprising a pair of series connected capacitors and a resistor connected between ground and a junction between the series connected capacitors.

32. A modem as claimed in claim 27, wherein the filter network comprises:

a) a first 4-port RC network connected between the first filter input and the primary network output; and

b) a second 4-port RC network connected between the second filter input and the primary network output;.

33. A modem as claimed in claim 32, wherein each 4-port RC network comprises first and second branches connected in parallel, the first branch comprising a pair of series connected resistors and a capacitor connected between ground and a junction between the series connected resistors; and the second branch comprising a pair of series connected capacitors and a resistor connected between ground and a junction between the series connected capacitors.

34. A modem as claimed in claim 19, wherein the feedback network comprises first and second branches connected in parallel, the first branch comprising a pair of series connected resistors and a capacitor connected between ground and a junction between the series

connected resistors; and the second branch comprising a capacitor.

35. A modem as claimed in claim 27, wherein the primary network output comprises a controllable gain stage.

36. A modem as claimed in claim 35, wherein the controllable gain stage comprises an attenuation network connected in parallel with a gain control switch.

37. A modem as claimed in claim 36, wherein the attenuation network is adapted to attenuate a signal substantially without altering a filter characteristic of the directional coupler.

38. A modem as claimed in claim 36, wherein the attenuation network comprises a pair of series connected resistors, and a capacitor connected in parallel with one of the pair of series connected resistors.

39. A modem as claimed in claim 36, wherein the gain control switch is adapted to selectively bypass the attenuation network.